FRED Reports

AN ANALYSIS OF NET BENEFITS
FROM PROPOSED CAPITAL IMPROVEMENT
INVESTMENTS IN STATE SALMON HATCHERIES

BY
Susan Lindauer
and
Jeff Hartman

Number 24

Alaska Department of Fish & Game
Division of Fisheries Rehabilitation,
Enhancement and Development

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Page 27 - Include data on attached page.

Page 53 - The y-axis of this graph should be labeled "millions of dollars."

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ABSTRACT

The Division of Fisheries Rehabilitation, Enhancement, and Development (FRED) has recently completed a benefit-cost analysis of state owned fish hatcheries in Alaska. The purpose of this study was to determine the effects of a proposed $5 million capital improvements investment on commercial and sport fish harvests. From there, a final step is to determine fishing profits from social and economic perspectives. The net benefits of a base case without investment were compared to a case with capital improvements (which considered the impact of a $5 million investment). The projections show that participants in the commercial and sport fishery will profit substantially from their support of fishery enhancement and rehabilitation. The study further suggests that such profits will escalate in the years ahead. If the state chooses to go forward with this alternative, it will gain a private net benefit of $11.4 for each $1 of public funds spent on capital improvements of fish hatcheries - that is a total net present value (revenues less costs) of $458.4 million in the CIP case.

The economic benefits from the proposed investment greatly exceed the costs of improvement and operation of the projects. Public policy makers who regard economic feasibility to be an important criterion for public investment are encouraged to take a close look at the potential of this resource as a means to produce substantial net benefits from an investment within our state. The analysis suggests that the investment will directly increase the welfare of those in the fishing industry and those pursuing fishing as a recreational activity. It will also indirectly benefit many sectors of the Alaskan economy.

This report explains how these conclusions were reached.

INTRODUCTION

The Division of Fisheries Rehabilitation, Enhancement, and Development (FRED) has recently completed a benefit-cost analysis of state owned fish hatcheries in Alaska. The intended audience of this work is the general public. The narrative has therefore been geared to the non economist and out of necessity contains some simplifications of economic theory. Both the biological and economic components of the analysis are dealt with in greater depth in the documentation for the Hatchery Broodstock Development and Facility Benefit-Cost Models for Public Fisheries Enhancement (Hartman and Rawson. 1983), and the Fishery and Economic Assumptions for the 1982/1983 Simulations (Hartman. 1983). These two support documents should be consulted by readers of this report with a background in economics.

This study is an analysis of one set of enhancement investment opportunities available to FRED Division. With the existence of over 2,000 stocks of salmon and thousands of miles of coast line in the state, the opportunities for fishery enhancement in Alaska are many. Since fisheries enhancement deals with a large set of choices we recommend an analysis system that examines a variety of investment alternatives. This will help to uncover the most efficient opportunities for enhancement and rehabilitation that finite enhancement dollars can buy. To accomplish this, a testing of other Divisional investment proposals in the form of two or three alternatives will help identify the optimum scheme.

We regard this study as an initial step in what should be an on-going search for optimal investment schemes.

MATERIALS AND METHODS

Distribution of Capital Improvements

This study focuses on potential hatchery improvements at existing sites located primarily in Southeast Alaska. These investments are likely to result in very large increases in salmon production. At Snettisham fifteen rearing containers (in addition to the existing nine) will be built. This will complete construction of that hatchery and increase its capacity three-fold. At the Klawock Hatchery, production will also increase because of a decision to lengthen the existing lake water intake system by 800 feet. This will allow the state to triple the number of enhancement-produced chum released in this area.

Planned capital improvements for Crystal Lake and Deer Mountain Hatcheries include an emergency water bypass system, in case the respective cities of Petersburg and Ketchikan should encounter failure of their hydro-lines. It is simply a stand-by water supply. Crystal Lake will also build additional rearing ponds and Deer Mountain will expand its capacity to

capture adult chinooks, holding the fish within the hatchery rather than in the stream. The latter measure will not increase production, but will reduce risk of fish loss.

In Southcentral Alaska, capital improvements for Cannery Creek Hatchery will consist of rearing pens for 10 million fingerlings, and the installation of a fry transport channel to move pink salmon fingerlings to outdoor rearing pens. This will increase the facility's production capacity and promote greater efficiency. Also, an adult holding transport channel will be installed to allow holding and collection of adults under controlled conditions.

The Fort Richardson Hatchery, also located in Southcentral Alaska, will benefit from an equipment purchase, and a visitors' center with a net gain of 8,000 visitor days per year. The method of compiling the costs for this hatchery differed from that used to project the costs of other hatcheries because it compared the costs of renting the essential pieces of equipment against the cost of purchasing the same items - (See Appendix A for detailed explanation).

The increment in net benefits results directly from the improvement of these few facilities which operate more efficiently and more productively. Greater efficiency minimizes costs which in turn consume less of the incoming revenues (Figure 1).

When comparing alternative uses of public funds, it is usual practice to use an identical interest rate although exceptions to this do exist. The Trustees of the Permanent Fund have recommended that all benefit-cost analyses in the state use the real interest rate (nominal less inflation) of 3% which represents the long-term real expected rate of return on the Fund investments (Jim Rhode, pers comm). According to Jim Rhode public investment projects made within Alaska frequently produce negative economic profits. An in-state investment alternative which was expected to produce positive profits would stand out well above conventional in-state alternatives.

The projections from this analysis show the positive net economic profits of a $5 million investment, and serve as an indicator of the efficiency of the proposed investments. Few investment alternatives exist that demonstrate such income-producing potential. If revenues from the state treasury are to be used efficiently to benefit Alaska, then the state must seek out those investment alternatives which actually increase the state's economic output. We are not formally comparing enhancement net benefits with all other possible investment alternatives. However discount rate can be considered as a baseline for expected returns on investments of Alaska's resources. The proposed fisheries-related projects compare favorably with this baseline. Carefully planned fishery rehabilitation, enhancement, and development is just such an alternative. By increasing the number of fish available for harvest, the state directly increases the total size of the economic pie, or the economic output of the fishing sectors. Greater profits will naturally induce spending in other areas as well.

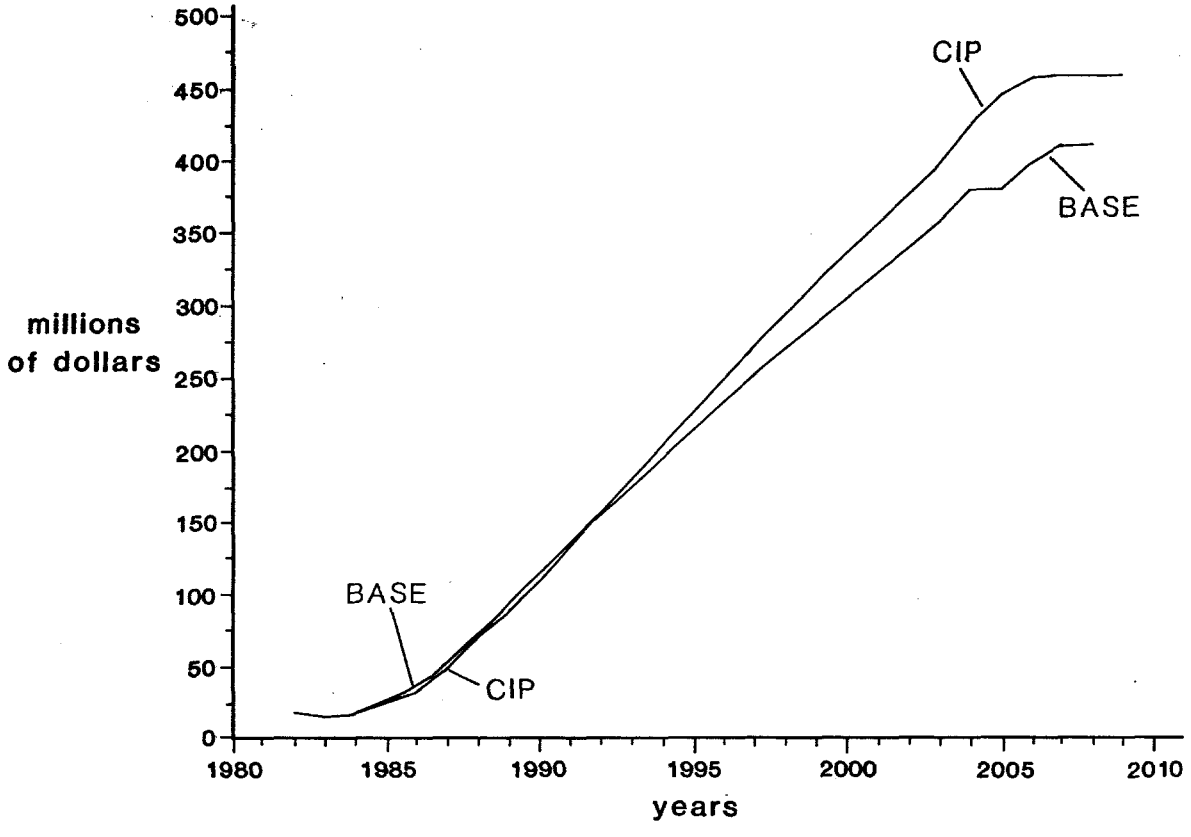

Figure 1. Net present values. Net present value of the base and CIP cases over the life of the program. 1992 is the payback year for the CIP case as cumulative revenues minus cumulative costs of the capital improvements case then begin to exceed the expected economic returns for the base case. There is a $47 million difference in the NPVs for these cases.

A simple way to view the benefits of the proposed investment is that the net sales value of the additional fish output is $47.3 million ($47.3 million is the net value difference between the CIP and base cases) greater than the income that would be earned if the $5 million were invested instead in Permanent Fund investments which are assumed to earn at a 3% real rate per year. Thus, the benefits of expanding FRED outweigh not only the monetary costs but also the opportunity cost of investing these public funds elsewhere. In the case of the sport harvested fish the "sales value" should be interpreted as what the consumer would be willing to pay for the opportunity to harvest the enhancement produced fish in a formal market transaction.

Structure of the Analysis and Model

Two simulations were constructed in order to facilitate an analysis of the net gains of hatchery investments. They are a base case simulation which contains operational costs through the year 2003 but lacks any future capital improvements, and a case which includes both CIP investment as well as operational costs through 2003. Development of the CIP case has, in specific cases, required the upward adjustment of the operational costs of individual hatcheries in order to account for increased fish production. By preparing cases with and without investment, we were able to measure and evaluate the effects of the investment on revenues and fish production.

The following equations were used to calculate the NPV (Net Present Value) and benefit-cost ratio of those cases. They are the standard formulas used by economists to evaluate public funded projects (Randall 1981).

1. $B_{pri} - C_{pri} - C_{pub}$ = Net Benefits (NPV)

2. $\frac{B_{pri} - C_{pri}}{Cpub}$ = Benefit-Cost Ratio (this ratio should never be reported without the Net Benefits or NPV)

When: B_{pri} = Marginal benefits (revenue) to the private sector as attributable to the enhancement-produced fish.

C_{pri} = Marginal costs to the private sector attributable to the enhancement-produced fish (e.g. cost of harvesting and/or processing, etc.)

C_{pub} = Marginal public costs from producing and managing enhancement-produced fish, e.g. operational cost, capital cost and planning costs of the hatchery.

It is possible to estimate with reasonable accuracy the ultimate benefits and costs of a long-term project. The enhancement economic feasibility model, consisting of the hatchery broodstock development (HBD) system, was designed for this very purpose. The HBD system projects future salmon production from a facility based on its current level of production, plans

for expansion (see Appendix B for annual production capacities through life of hatchery), life-stage survival assumptions (Appendix C) and fishery exploitation expectations. The facility benefit cost (FBC) system simulates the benefit and cost streams from HBD harvest predictions for each individual hatchery (see Appendix D for NPV results of individual hatcheries).

The FBC Model contains two separate components. The first is a price index model which adjusts past nominal costs and benefits to base year dollars for ex-post analysis. The second is an ex-ante or future-oriented program which estimates the present values of a number of benefit and cost stream alternatives.

In order to project the annual operating costs (Appendix E), we have relied on past hatchery performance data and on estimates of future salmon production.

A similar method was used to estimate the future exvessel price of salmon. Many economists hold that a several year average of recent prices is a reasonable method of assessing long-run price trends (Kramer et al. 1980). Total revenues began to exceed long-run total costs in 1991 for the net benefit scheme. One fisheries economist (Crutchfield et al. 1982) used a three-year price range to estimate the mean. We have followed this approach to price assessment, establishing the average for future prices first by individual hatcheries and then in a summary by species through the year 2003 using 1979, 1980, and 1981 prices.

These estimates may be considered quite accurate for long term projections because the real price of salmon adjusted for inflation has remained quite stable in the past 20 years despite the rise in nominal wholesale prices and large fluctuations in harvest (see Appendix F).

Results

If the hatcheries continue to operate with no additional capital improvements, the base case benefits generated to the commercial fleet and sport fisheries, less operational and opportunity costs will equal $411.1 million by the 25th year of adult returns. In terms of the benefit-cost ratio, this means that for each $1 of public funds spent to maintain the hatcheries, $3.67 will be generated as revenues for the fishing industry and value to the sport fishery.

On the other hand, the public investment of approximately $5 million (with included operational cost) will generate a net income of $458.4 million. The result is a net benefit of approximately $47 million over the base case (see annual value graph in Appendix G) or an annual return of approximately $4 million beginning at that time. The year of pay back is 1991.

That is:

CIP case (investment)	$B_{pri} - C_{pri} - C_{pub}$	= $458.4 million
Base case (no investment)	$B_{pri} - C_{pri} - C_{pub}$	= $411.1 million
Net Net Benefits of Proposed Investment		$ 47.3 million.

The value of the investment, from the increment in the budget, can be measured by this difference of the net present values for the base and CIP cases. Expressed in a benefit-cost ratio, $11.36 will be gained for each $1 spent.[1] The capital improvements will make the operation of the subject fish hatcheries more efficient. In some cases there will be reduced operation costs. In other cases the efficiency will be gained by an increase in fish production which will have a larger value than the gain in project operating cost. However, this investment also will directly result in increased total fish production (Figure 2), commercial fish production (Figure 3), and sport fish production (Figure 4). So that we could accurately measure the effects of improvement on production, fish harvested prior to 1982 have not been counted in the study. As of 1992, the year of payback on the investment, approximately 1 million more fish are produced in the CIP case than in the base case. Both graphs reflect a decline in numbers from 1992-93, gradually building up again through the year 2003. This is because pink salmon are displaced by chums as hatcheries shift to production of the latter species. Still, a comparison of the total number of fish produced in each reveals that the CIP case is more productive than the base case by a 10% margin. The increase in chum harvests accounts for much of this growth in output as it is the focus of production at Snettisham and Klawock which have both been targeted to receive substantial budget allocations for capital improvements in 1985-86.

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[1] The B/C ratio should never be reported without the NPV. However, when calculating the B/C ratio from the NPV it is important that one remember to add costs to the net benefits in order to reflect accurately the total value of the project. For example, if the government invests $100 and earns a NPV of $50 (when total costs are subtracted from total revenues), then it has really earned total revenues of $150.

$150 - costs of $100 = NPV of $50

Working backwards, the NPV + costs = total revenues

50 + 100 = 150

$$\frac{\text{Total revenues}}{\text{Total Costs}} = \text{Benefit:Cost Ratio}$$

Or in this case $\frac{150}{100}$ = a B/C ratio of 1.5:1

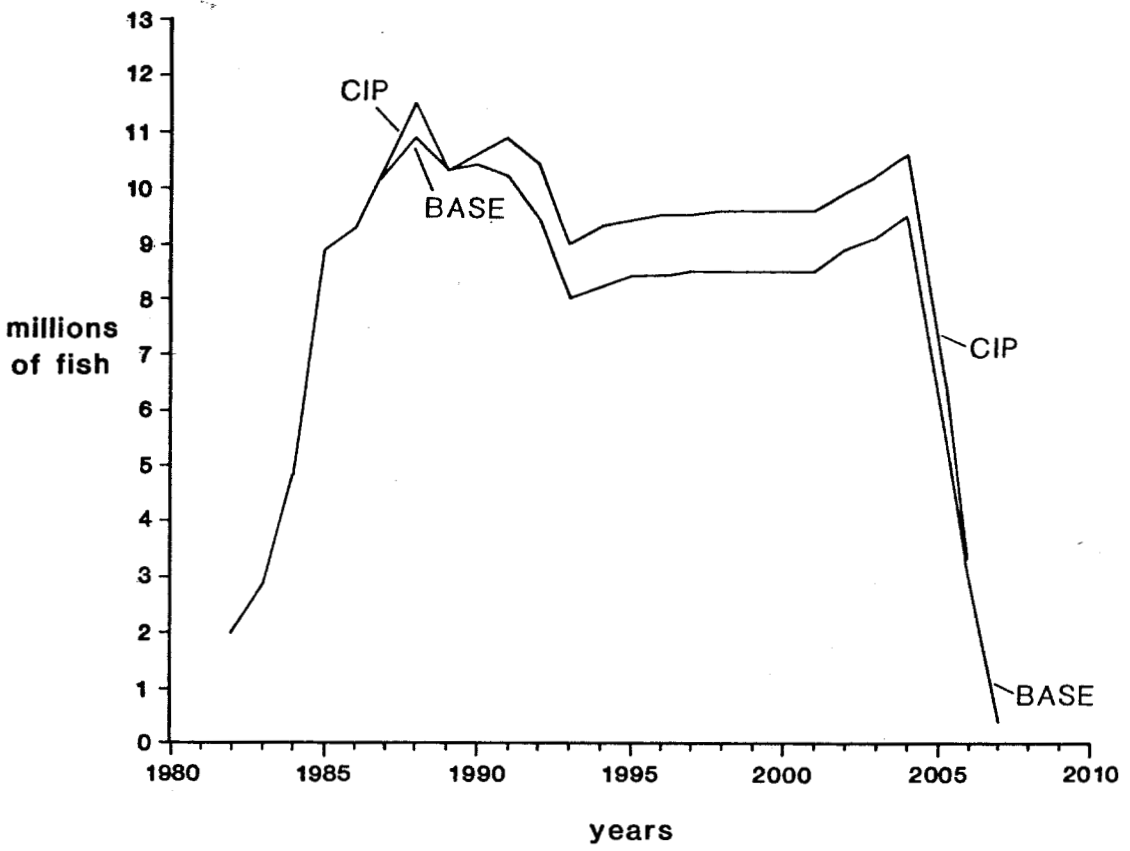

Figure 2. Projected total number of fish harvested for all species.

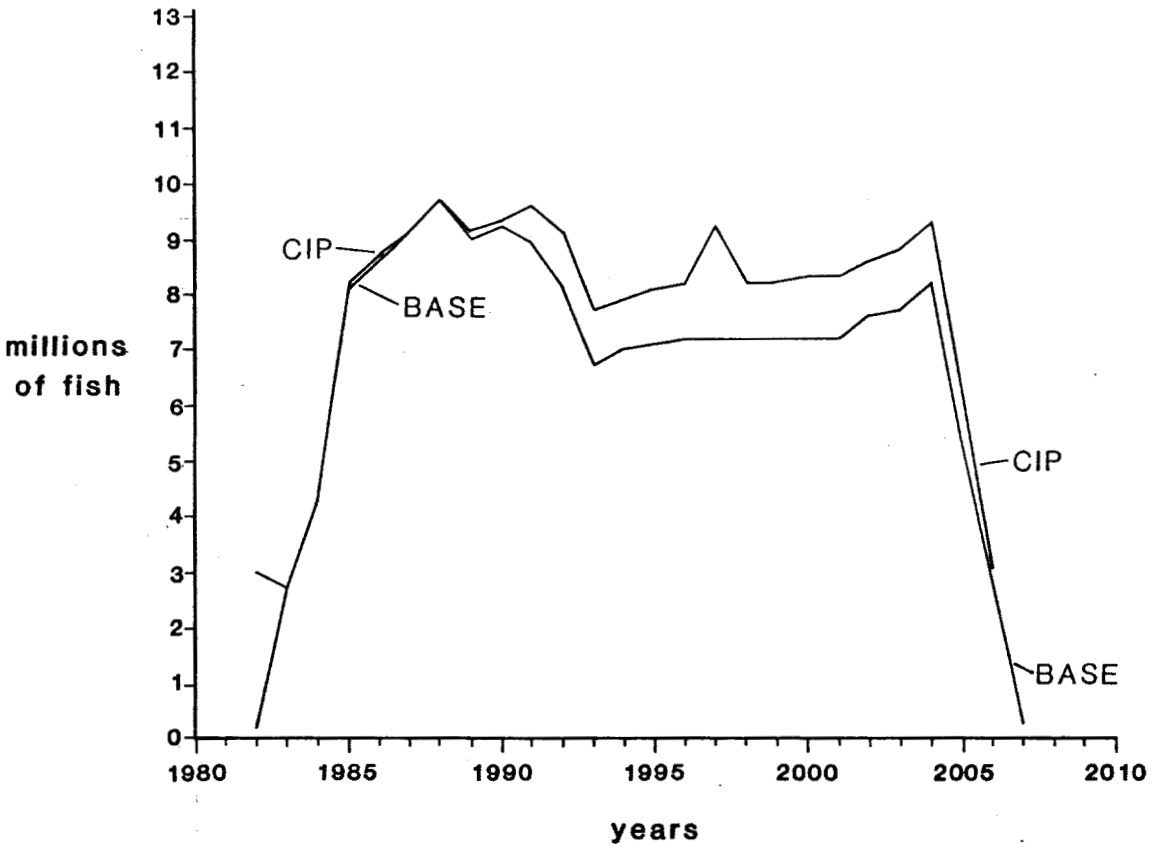

Figure 3. Projected total number of fish commercially harvested.

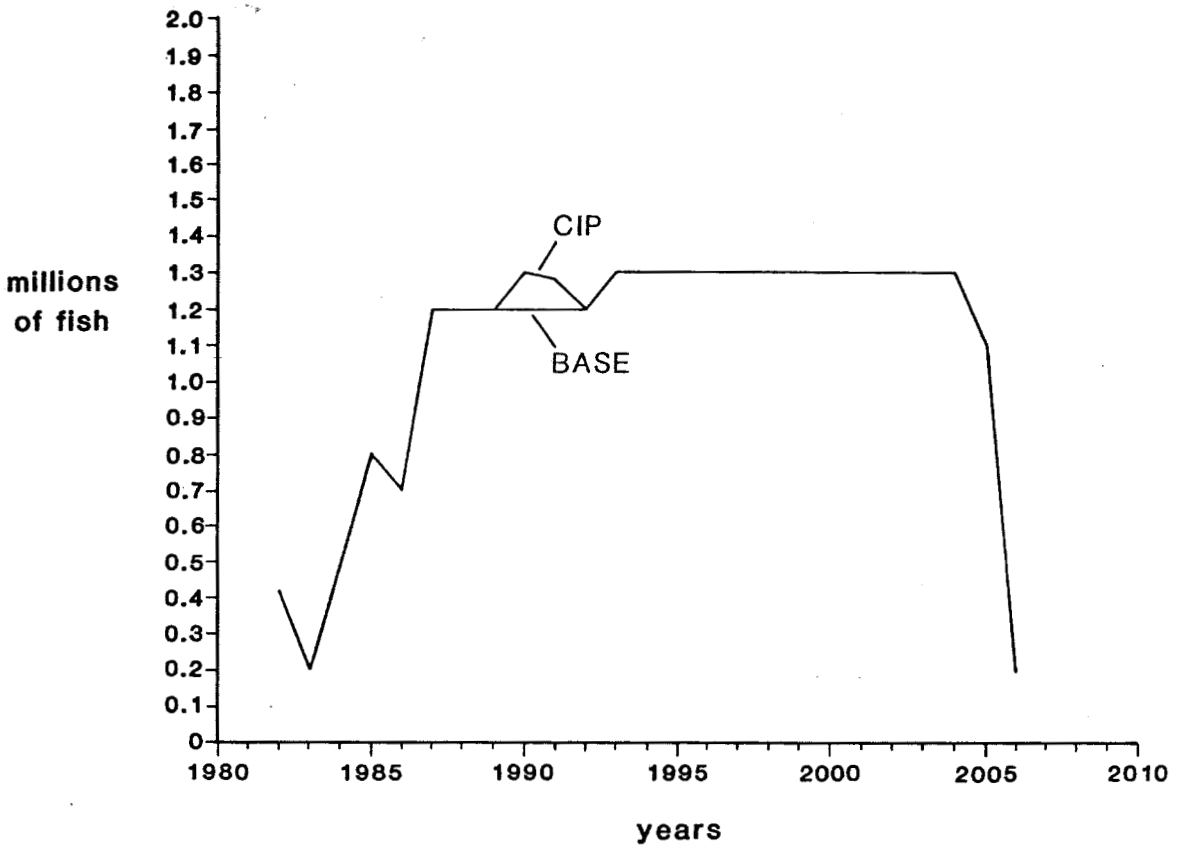

Figure 4. Projected total number of sport fish harvested.

In the peak years from 1992-2003, there will be an annual average return of approximately 1 million more chum salmon in the CIP case than in the base case (Figure 5). As chum salmon are exclusively harvested by commercial fishermen, the increased fish production will have a tremendous impact on that fishing sector. The net benefit (less costs) of this species in the CIP case is estimated at $158.3 million. This compares to a net benefit of only $112.1 million in the base case. Production appears to grow slowly from the time of the investment until the maximum production level is achieved. This is because of the chum's life span and the relatively long period spent in the ocean before the fish return to spawn.

In contrast to chum salmon, pink salmon remain in the ocean only one year before returning to spawn. The short pink salmon life cycle provides for a fast harvest build-up from the enhancement-produced pink salmon (Figure 6). Even so, hatchery production of this species will decline in the mid-1980's, because several hatcheries are scheduled to emphasize the production of chums over pinks. The number of pink salmon will therefore decline while the number of chums will increase.

For the purpose of our study the year 2003 marks the end of hatchery operations.[1] When the hatcheries stop production and no longer require an allocation from the annual escapements, there will be a temporary increase in allocation to the commercial and sport harvest. Although this will not result in a lasting increase in production, neither will the number of fish harvested immediately drop vertically to zero. The enhancement produced harvest will drop off to one or more distinct plateaus before reaching zero harvest rates, because some salmon species have a longer stream, lake and/or ocean residency than others (the drop-off that occurs after year 2003 in the fish production and NPV figure is essentially an artifact produced by plotting the results of the economic analysis over a fixed facility life span).

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[1] Many fishery and resource economists have chosen to measure fishery enhancement production and revenues over a 20-30 year period. This time interval also corresponds to the average life of the major components in a hatchery.

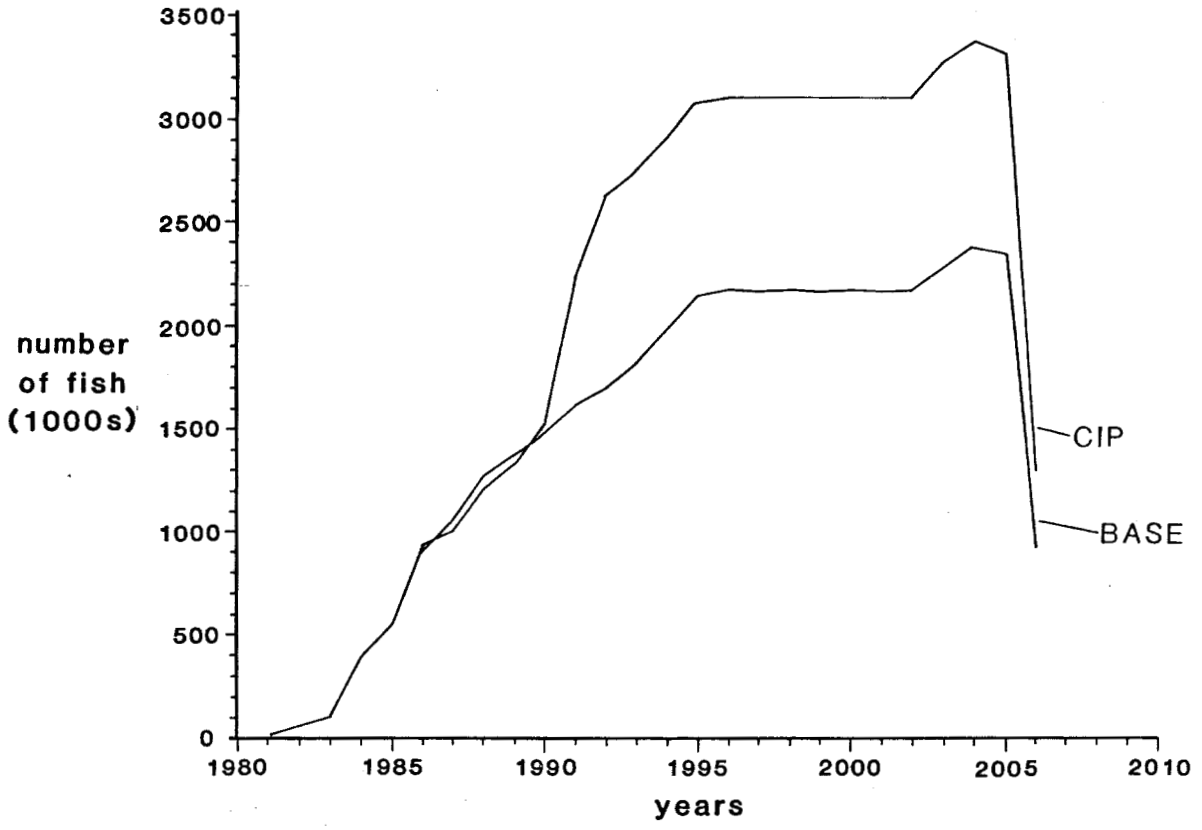

Figure 5. Projected total number of chum salmon harvested in the base and CIP cases over the life of the hatcheries.

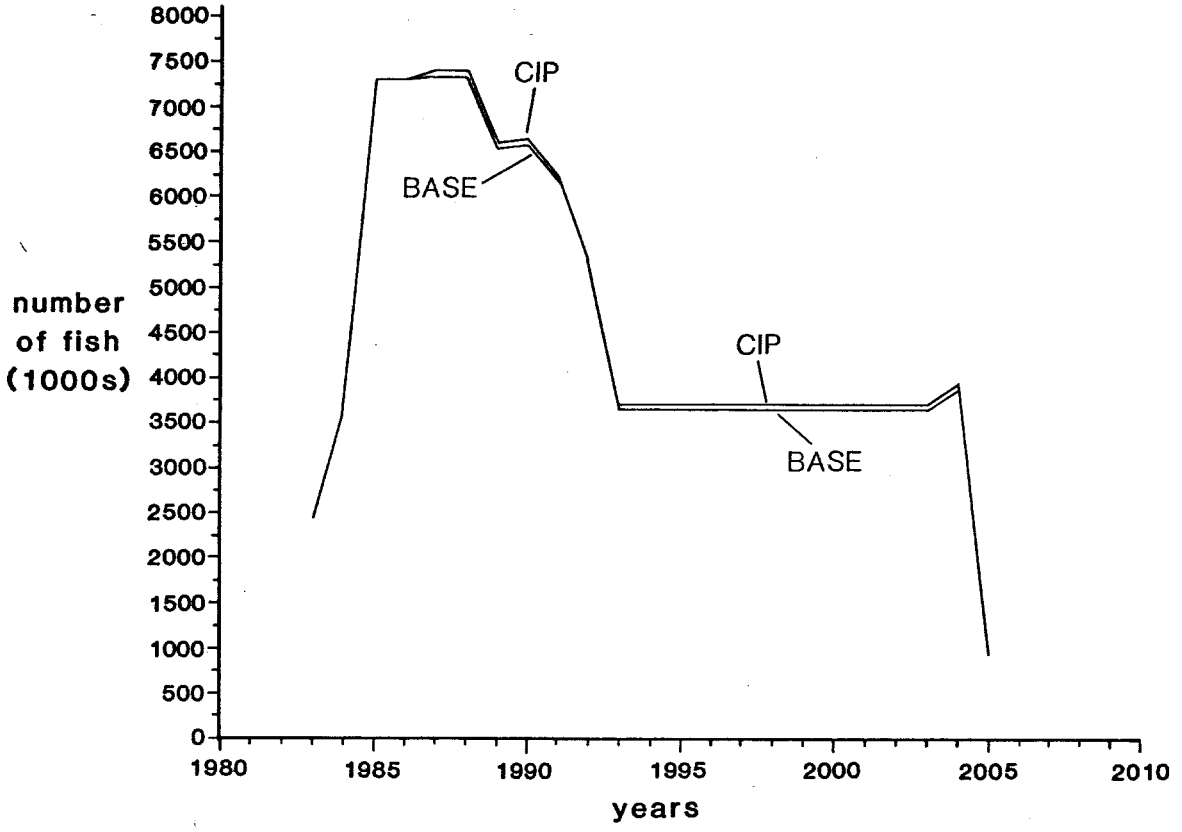

Figure 6. Projected total number of pink salmon harvested in the CIP case over the life of the hatcheries.

DISCUSSION

The projections of benefits and costs presented in this study forecast net benefits of approximately $47 million which result from the CIP investment of approximately $5 million. Additionally, an overall Net Present Value of $450 million is projected from cumulative CIP investments when added to the base case. It is tempting to conclude from these results that most enhancement investments will produce similar economic returns. As this analysis occurs only on two investment schemes such a conclusion should be regarded as tentative. A formal analysis of the new or proposed alternate investment would be required to extend our results to other projects.

What we can conclude is that the continued up keep and program improvements outlined in this study forecast significant increases in revenue for commercial and sport fisherman. If our assumptions are true, the additional value and income from these projects will greatly exceed the financial and opportunity costs of operation and expansion. Furthermore, the program can raise the level of productivity in the commercial fishing sector. Increased profits are likely to include spending in other areas as well. Finally, the analyses forecasts growth in the value of the sport fishery by increasing catch expectations. If policy makers are interested in maximizing the net benefits of investments from the state treasury, then fishery enhancement projects (projects which meet stringent economic feasibility tests) provide an attractive investment opportunity.

It is easy to portray an over simplified picture of the economic consequences of fisheries enhancement in Alaska since many investments may have both efficiency and equity (and even moral) implications.

We consulted many economists as we developed these methods. They have suggested that in-state investments in Alaska have generally not been a promising source of positive economic rent. Our analyses suggest that carefully planned investment in fisheries enhancement provide positive economic rent in an economic environment that is otherwise predominantly negative-rent producing.

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APPENDIX A:

An Explanation of Methods Used to Assess Fort Richardson Costs

This narrative explains how the analysts determined the operation and expansion costs of the Fort Richardson hatchery CIP. It compares the maintenance and replacement costs of purchased items to the periodic rental costs of identical items over the life of the hatchery.

1) The costs of all CIP equipment that cannot be rented have been estimated for the Fort Richardson base and Fort Richardson CIP cases in the capital costs column for 1983. That sum equals $\$45.1 \times 10^3$. The average life of each purchased equipment item has been estimated and the annual purchase price has been added to each year by dividing the purchase price by the life of the item.

2) For the base case, rental amounts were estimated for items which are feasible to rent. Also, the fraction of the year which they will be in use was factored against the monthly rental costs. The rental costs per year were then added to the base case in the annual operating costs which already included evaluation and administration costs.

   a) For items not in the sample, rental amounts were estimated by selecting a random sample of items from the rental list and obtaining a quote of the monthly rental rate. First the rental rate per year was estimated and then a fraction of rental rate per year over the purchase price per year was estimated. The purchase price per year equaled the total price from the CIP request divided by the life for each item. The fraction of:

$$\frac{\text{rental cost per year}}{\text{purchase cost per year}}$$

   was them multiplied against the purchase cost per year for the items not in the sample to determine their annual rental prices. The rental price of $35,541 per year was entered to each year in the Fort Richardson Base case in the operational cost column. Finally the total annualized purchase price is entered for every operating year in the CIP case.

3) Fort Richardson CIP: add annual purchase cost through 2003 in capital cost column.

4) Fort Richardson Base: add annual rental cost to annual operating costs.

APPENDIX B:

Annual Production Capacities
Listed by Hatchery for Each Species

A note on using Appendix #B: Capacities for each hatchery in the Base and CIP cases are arranged vertically in rows. Since the capacities are listed by hatchery species (or stock) and by year intervals some may have several formats while other hatcheries will only have one or two.

Table -. Salmon hatchery capacities by hatchery, species, and year for Base Case simulations.

Hatchery	Snett.	Species	CHUM
Year	1983	to Year	2002
Green Egg	14.000		
Eyed Egg	12.600		
Fry (emerge)	11.340		
Fry (fed)	10.773		
Fingerling	10.234		
Smolt			

Hatchery	Snett.-CIP	Species	CHINOOK
Year	1983	to Year	1986
Green Egg	2.200		
Eyed Egg	1.970		
Fry (emerge)	1.871		
Fry (fed)	1.684		
Fingerling	1.600		
Smolt	1.200		

Hatchery	Snett.	Species	CHINOOK
Year	1983	to Year	2002
Green Egg	2.200		
Eyed Egg	1.970		
Fry (emerge)	1.871		
Fry (fed)	1.684		
Fingerling	1.600		
Smolt	1.200		

Hatchery	Snett.-CIP	Species	CHINOOK
Year	1987	to Year	2002
Green Egg	4.000		
Eyed Egg	3.600		
Fry (emerge)	3.420		
Fry (fed)	3.249		
Fingerling	3.086		
Smolt	2.469		

Hatchery	Snett.	Species	COHO
Year	1983	to Year	2002
Green Egg	1.500		
Eyed Egg	1.370		
Fry (emerge)	1.340		
Fry (fed)	1.207		
Fingerling			
Smolt	0.300		

Hatchery	Snett.-CIP	Species	COHO
Year	1983	to Year	1986
Green Egg	1.500		
Eyed Egg	1.370		
Fry (emerge)	1.340		
Fry (fed)	1.207		
Fingerling	---		
Smolt	0.300		

Hatchery	Snett.-CIP	Species	CHUM
Year	1983	to Year	1986
Green Egg	14.000		
Eyed Egg	12.600		
Fry (emerge)	11.340		
Fry (fed)	10.773		
Fingerling	10.234		
Smolt			

Hatchery	Snett.-CIP	Species	COHO
Year	1987	to Year	2002
Green Egg	1.540		
Eyed Egg	1.420		
Fry (emerge)	1.390		
Fry (fed)	1.250		
Fingerling	---		
Smolt	0.900		

Hatchery	Snett.-CIP	Species	CHUM
Year	1987	to Year	2002
Green Egg	71.000		
Eyed Egg	63.900		
Fry (emerge)	57.510		
Fry (fed)	54.630		
Fingerling	51.900		
Smolt			

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

Salmon hatchery capacities by hatchery, species, and year for Base Case simulations.

MILLIONS OF FISH

Hatchery	BEAVER FALL	Species	CHUM
Year	1983	to Year	2002
Green Egg	19.180		
Eyed Egg	17.260		
Fry (emerge)	16.400		
Fry (fed)	15.580		
Fingerling	14.800		
Smolt	---		

Hatchery	CANNERY	Species	PINKS (BASE)
Year	1983	to Year	2003
Green Egg	50.000		
Eyed Egg	47.000		
Fry (emerge)	44.650		
Fry (fed)	------		
Fingerling	-------		
Smolt	------		

Hatchery	BIG LAKE	Species	SOCKEYE
Year	1983	to Year	2003
Green Egg	15.980		
Eyed Egg	13.580		
Fry (emerge)	12.900		
Fry (fed)	8.000		
Fingerling	----		
Smolt	----		

Hatchery	CANNERY	Species	PINKS (CIP)
Year	1983	to Year	2003
Green Egg	50.000		
Eyed Egg	47.000		
Fry (emerge)	44.650		
Fry (fed)	10.530		
Fingerling	10.000		
Smolt	----		

Hatchery	BIG LAKE	Species	SOCK REHA
Year	1983	to Year	2006
Green Egg	1237.150		
Eyed Egg	1051.580		
Fry (emerge)	999.000		
Fry (fed)	999.000		
Fingerling	-----		
Smolt	-----		

Hatchery	CROOKED CR	Species	SOCKEYE
Year	1983	to Year	2002
Green Egg	22.570		
Eyed Egg	20.320		
Fry (emerge)	19.300		
Fry (fed)	3.000		
Fingerling	15.500		
Smolt	-----		

Hatchery	BIGLAKE	Species	COHO
Year	1983	to Year	2004
Green Egg	4.0		
Eyed Egg	3.72		
Fry (emerge)	3.53		
Fry (fed)	3.36		
Fingerling	3.19		
Smolt			

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

Hatchery	BIGLAKE	Species	COHO REHA
Year	1983	to Year	2006
Green Egg	1130.730		
Eyed Egg	1051.580		
Fry (emerge)	999.000		
Fry (fed)	-----		
Fingerling	-----		
Smolt	-----		

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

- Continued -

Continued.

MILLIONS OF FISH

Hatchery CLEAR	Species CHUMS	Hatchery	Species
Year 1983	to Year 2003	Year	to Year
Green Egg	.520	Green Egg	
Eyed Egg	.470	Eyed Egg	
Fry (emerge)	.445	Fry (emerge)	
Fry (fed)	.422	Fry (fed)	
Fingerling	.401	Fingerling	
Smolt	-----	Smolt	

Hatchery CLEAR	Species CHINOOK	Hatchery DEER MT.	Species CHINOOK (BASE
Year 1983	to Year 1983	Year 1983	to Year 2002
Green Egg	.220	Green Egg	.340
Eyed Egg	.200	Eyed Egg	.300
Fry (emerge)	.188	Fry (emerge)	.287
Fry (fed)	.170	Fry (fed)	.250
Fingerling	.170	Fingerling	.240
Smolt	-----	Smolt	.188

Hatchery CLEAR	Species CHINOOK	Hatchery DEER MT.	Species CHINOOK (BASE
Year 1984	to Year 2003	Year 2003	to Year 2003
Green Egg	.220	Green Egg	.300
Eyed Egg	.200	Eyed Egg	.270
Fry (emerge)	.188	Fry (emerge)	.260
Fry (fed)	.178	Fry (fed)	.250
Fingerling	.170	Fingerling	.240
Smolt	-----	Smolt	.188

Hatchery CLEAR	Species SHEEFISH	Hatchery DEER MT.	Species CHINOOK (CIP)
Year 1983	to Year 2003	Year 1983	to Year 2002
Green Egg	1.850	Green Egg	.340
Eyed Egg	1.670	Eyed Egg	.300
Fry (emerge)	1.500	Fry (emerge)	.287
Fry (fed)	-----	Fry (fed)	.250
Fingerling	-----	Fingerling	.240
Smolt	-----	Smolt	.188

Hatchery CLEAR	Species GRAYLING	Hatchery DEER MT.	Species CHINOOK (CIP)
Year 1983	to Year 2003	Year 2003	to Year 2003
Green Egg		Green Egg	.300
Eyed Egg		Eyed Egg	.270
Fry (emerge)		Fry (emerge)	.260
Fry (fed)		Fry (fed)	.250
Fingerling		Fingerling	.240
Smolt		Smolt	.188

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Continued.

MILLIONS OF FISH

Hatchery ELMENDORF Species RAINBOW	
Year 1983 to Year 1983	
Green Egg	3.100
Eyed Egg	2.790
Fry (emerge)	2.650
Fry (fed)	2.600
Fingerling	.140
Smolt	.140

Hatchery ELMENDORF Species COHO ANAD	
Year 1984 to Year 2003	
Green Egg	1.570
Eyed Egg	1.410
Fry (emerge)	1.340
Fry (fed)	1.206
Fingerling	.706
Smolt	.385

Hatchery ELMENDORF Species RAINBOW	
Year 1984 to Year 1984	
Green Egg	4.890
Eyed Egg	4.400
Fry (emerge)	4.180
Fry (fed)	2.506
Fingerling	.100
Smolt	.061

Hatchery ELMENDORF Species COHOLANDLOCKED	
Year 1984 to Year 2003	
Green Egg	.260
Eyed Egg	.230
Fry (emerge)	.220
Fry (fed)	.210
Fingerling	.200
Smolt	----

Hatchery ELMENDORF Species RAINBOW	
Year 1985 to Year 2003	
Green Egg	2.000
Eyed Egg	1.800
Fry (emerge)	1.760
Fry (fed)	1.061
Fingerling	.061
Smolt	.061

Hatchery ELMENDORF Species COHO LANDLOCKED	
Year 2004 to Year 2004	
Green Egg	.260
Eyed Egg	.230
Fry (emerge)	.220
Fry (fed)	.210
Fingerling	----
Smolt	----

Hatchery ELMENDORF Species CHINOOK	
Year 1983 to Year 1984	
Green Egg	.660
Eyed Egg	.590
Fry (emerge)	.583
Fry (fed)	.554
Fingerling	.526
Smolt	.500

Hatchery _____ Species _____	
Year _____ to Year _____	
Green Egg	
Eyed Egg	
Fry (emerge)	
Fry (fed)	
Fingerling	
Smolt	

Hatchery ELMENDORF Species CHINOOK	
Year 1985 to Year 2003	
Green Egg	1.090
Eyed Egg	.980
Fry (emerge)	.930
Fry (fed)	.880
Fingerling	.840
Smolt	.800

Hatchery _____ Species _____	
Year _____ to Year _____	
Green Egg	
Eyed Egg	
Fry (emerge)	
Fry (fed)	
Fingerling	
Smolt	

- Continued -

Continued.

MILLIONS OF FISH

BASE

Hatchery	KLAWOCK	Species	CHUM
Year	1983	to Year	2002
Green Egg	14.970		
Eyed Egg	13.470		
Fry (emerge)	12.800		
Fry (fed)	6.320		
Fingerling	6.000		
Smolt	-----		

Hatchery	KLAWOCK	Species	STEELHEAD
Year	1983	to Year	2002
Green Egg	.020		
Eyed Egg	.020		
Fry (emerge)	.018		
Fry (fed)	.017		
Fingerling	.016		
Smolt	.014		

Hatchery	KLAWOCK	Species	STEELHEAD
Year	2003	to Year	2003
Green Egg	.030		
Eyed Egg	.020		
Fry (emerge)	.020		
Fry (fed)	.020		
Fingerling	.020		
Smolt	.014		

Hatchery	KLAWOCK	Species	COHO
Year	1983	to Year	2002
Green Egg	1.600		
Eyed Egg	1.440		
Fry (emerge)	1.372		
Fry (fed)	1.234		
Fingerling	1.111		
Smolt	1.000		

Hatchery	KLAWOCK	Species	COHO
Year	2003	to Year	2003
Green Egg	1.620		
Eyed Egg	1.460		
Fry (emerge)	1.390		
Fry (fed)	1.320		
Fingerling	1.250		
Smolt	1.000		

CIP

Hatchery	KLAWOCK	Species	CHUM
Year	1983	to Year	1986
Green Egg	14.970		
Eyed Egg	13.470		
Fry (emerge)	12.800		
Fry (fed)	6.320		
Fingerling	6.000		
Smolt	-----		

Hatchery	KLAWOCK	Species	CHUM
Year	1987	to Year	2002
Green Egg	29.240		
Eyed Egg	26.320		
Fry (emerge)	25.000		
Fry (fed)	13.330		
Fingerling	12.000		
Smolt	-----		

Hatchery	KLAWOCK	Species	STEELHEAD
Year	1983	to Year	2002
Green Egg	.020		
Eyed Egg	.020		
Fry (emerge)	.018		
Fry (fed)	.017		
Fingerling	.016		
Smolt	.014		

Hatchery	KLAWOCK	Species	STEELHEAD
Year	2003	to Year	2003
Green Egg	.030		
Eyed Egg	.027		
Fry (emerge)	.024		
Fry (fed)	.022		
Fingerling	.020		
Smolt	.014		

Hatchery	KLAWOCK	Species	COHO
Year	1983	to Year	2002
Green Egg	1.510		
Eyed Egg	1.470		
Fry (emerge)	1.372		
Fry (fed)	1.234		
Fingerling	1.111		
Smolt	1.000		

Hatchery	KLAWOCK	Species	COHO
Year	2003	to Year	2003
Green Egg	1.620		
Eyed Egg	1.460		
Fry (emerge)	1.390		
Fry (fed)	1.320		
Fingerling	1.250		
Smolt	1.000		

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Continued.

MILLIONS OF FISH

Hatchery FT.RICH	Species RAINBOW
Year 1983	to Year 1984
Green Egg	.160
Eyed Egg	.130
Fry (emerge)	.110
Fry (fed)	.090
Fingerling	.089
Smolt	.060

Hatchery FT RICH	Species COHO
Year 1983	to Year 1983
Green Egg	.390
Eyed Egg	.350
Fry (emerge)	.330
Fry (fed)	.316
Fingerling	.300
Smolt	-----

Hatchery FT. RICH	Species RAINBOW
Year 1985	to Year 2004
Green Egg	4.290
Eyed Egg	3.440
Fry (emerge)	2.920
Fry (fed)	2.625
Fingerling	.122
Smolt	.120

Hatchery FT RICH	Species COHO
Year 1984	to Year 1985
Green Egg	1.290
Eyed Egg	1.160
Fry (emerge)	1.100
Fry (fed)	1.050
Fingerling	1.000
Smolt	.320

Hatchery FT. RICH	Species STEELHEAD
Year 1983	to Year 1983
Green Egg	.100
Eyed Egg	.090
Fry (emerge)	.068
Fry (fed)	.061
Fingerling	.061
Smolt	.060

Hatchery FT RICH	Species COHO
Year 1986	to Year 2004
Green Egg	1.750
Eyed Egg	1.580
Fry (emerge)	1.500
Fry (fed)	1.470
Fingerling	1.400
Smolt	.640

Hatchery FT RICH	Species STEELHEAD
Year 1984	to Year 2004
Green Egg	.200
Eyed Egg	.160
Fry (emerge)	.136
Fry (fed)	.122
Fingerling	.122
Smolt	.120

Hatchery FT RICH	Species CHINOOK
Year 1983	to Year 1984
Green Egg	.520
Eyed Egg	.470
Fry (emerge)	.443
Fry (fed)	.421
Fingerling	.400
Smolt	.320

Hatchery FT RICH	Species STEELHEAD
Year 2005	to Year 2006
Green Egg	.200
Eyed Egg	.160
Fry (emerge)	.140
Fry (fed)	.120
Fingerling	.120
Smolt	.120

Hatchery FT RICH	Species CHINOOK
Year 1985	to Year 1986
Green Egg	1.380
Eyed Egg	1.240
Fry (emerge)	.886
Fry (fed)	.842
Fingerling	.800
Smolt	.640

Hatchery Ft Rich: Chinook	
Year 1987	to Year 2004
Greenegg	1.610
Eyed Egg	1.450
Fry (emerg)	1.380
Fry (fed)	1.300
Fingerling	1.250
Smolt	1.000

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Continued.

MILLIONS OF FISH

Hatchery	CRYSTAL	Species	CHUM
Year	1983	to Year	2002
Green Egg	.320		
Eyed Egg	.280		
Fry (emerge)	.275		
Fry (fed)	.250		
Fingerling	----		
Smolt	----		

Hatchery	CRYSTAL	Species	COHO
Year	1983	to Year	1983
Green Egg	2.980		
Eyed Egg	2.830		
Fry (emerge)	2.800		
Fry (fed)	.500		
Fingerling	.130		
Smolt	.130		

Hatchery	CRYSTAL	Species	CHINOOK
Year	1983	to Year	2002
Green Egg	2.630		
Eyed Egg	2.020		
Fry (emerge)	1.698		
Fry (fed)	1.528		
Fingerling	1.222		
Smolt	.900		

Hatchery	CRYSTAL	Species	COHO
Year	1984	to Year	2002
Green Egg	1.500		
Eyed Egg	1.420		
Fry (emerge)	1.410		
Fry (fed)	.131		
Fingerling	.130		
Smolt	.130		

Hatchery	CRYSTAL	Species	CHINOOK
Year	2003	to Year	2003
Green Egg	2.610		
Eyed Egg	2.010		
Fry (emerge)	1.690		
Fry (fed)	1.520		
Fingerling	1.220		
Smolt	.900		

Hatchery	CRYSTAL	Species	COHO
Year	2003	to Year	2003
Green Egg	.140		
Eyed Egg	.140		
Fry (emerge)	.140		
Fry (fed)	.130		
Fingerling	.130		
Smolt	.130		

Hatchery	CRYSTAL	Species	STEELHEAD
Year	1983	to Year	2002
Green Egg	.120		
Eyed Egg	.060		
Fry (emerge)	.062		
Fry (fed)	.050		
Fingerling	.050		
Smolt	.036		

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

Hatchery	CRYSTAL	Species	STEELHEAD
Year	2003	to Year	2003
Green Egg	.100		
Eyed Egg	.050		
Fry (emerge)	.050		
Fry (fed)	.050		
Fingerling	.050		
Smolt	.036		

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

- Continued -

Continued.

MILLIONS OF FISH

Hatchery	FRAZER	Species	SOCKEYE
Year	1982	to Year	2001
Green Egg			
Eyed Egg	1.022		
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

Hatchery	HIDDEN	Species	CHINOOK
Year	1983	to Year	2002
Green Egg	.180		
Eyed Egg	.160		
Fry (emerge)	.154		
Fry (fed)	.139		
Fingerling	.125		
Smolt	.100		

Hatchery	GULKANA	Species	SOCKEYE
Year	1983	to Year	2003
Green Egg	10.040		
Eyed Egg	9.030		
Fry (emerge)	8.400		
Fry (fed)	-----		
Fingerling	-----		
Smolt	-----		

Hatchery	HIDDEN	Species	CHINOOK
Year	2003	to Year	2003
Green Egg	.160		
Eyed Egg	.150		
Fry (emerge)	.140		
Fry (fed)	.130		
Fingerling	.130		
Smolt	.100		

Hatchery	HIDDENFALL	Species	CHUM
Year	1983	to Year	1983
Green Egg	42.380		
Eyed Egg	38.140		
Fry (emerge)	37.000		
Fry (fed)	26.320		
Fingerling	25.000		
Smolt	-----		

Hatchery	KARLUK	Species	SOCKEYE ENHANC
Year	1983	to Year	2003
Green Egg	69.800		
Eyed Egg	59.330		
Fry (emerge)	17.800		
Fry (fed)	-----		
Fingerling	-----		
Smolt	-----		

Hatchery	HIDDEN FLS	Species	CHUM
Year	1984	to Year	1984
Green Egg	53.800		
Eyed Egg	48.420		
Fry (emerge)	46.000		
Fry (fed)	26.320		
Fingerling	25.000		
Smolt	----		

Hatchery	KARLUK	Species	SOCKEYE REHAB
Year	1983	to Year	2007
Green Egg	3847.060		
Eyed Egg	3270.000		
Fry (emerge)	981.000		
Fry (fed)	981.000		
Fingerling	-----		
Smolt	-----		

Hatchery	HIDDEN	Species	CHUM
Year	1985	to Year	2002
Green Egg	66.500		
Eyed Egg	59.850		
Fry (emerge)	58.055		
Fry (fed)	26.320		
Fingerling	25.000		
Smolt	-----		

Hatchery	KITOI	Species	PINKS
Year	1983	to Year	2003
Green Egg	85.960		
Eyed Egg	77.370		
Fry (emerge)	73.500		
Fry (fed)	8.000		
Fingerling	7.220		
Smolt	------		

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Continued.

MILLIONS OF FISH

Hatchery	MAIN BAY	Species	CHUM
Year	1983	to Year	2003
Green Egg	92.980		
Eyed Egg	83.680		
Fry (emerge)	79.500		
Fry (fed)	26.320		
Fingerling	25.000		
Smolt	----		

Hatchery	RUSSELL	Species	CHUM
Year	alternate years	to Year	1983-2003
Green Egg	25.030		
Eyed Egg	22.530		
Fry (emerge)	21.400		
Fry (fed)	20.300		
Fingerling	19.300		
Smolt	-----		

Hatchery	MAIN BAY	Species	PINKS
Year	1983	to Year	1986
Green Egg	113.800		
Eyed Egg	102.420		
Fry (emerge)	97.300		
Fry (fed)	-----		
Fingerling	-----		
Smolt	-----		

Hatchery	RUSSELL	Species	CHUM
Year	alternate years	to Year	1984-2002
Green Egg	12.510		
Eyed Egg	11.260		
Fry (emerge)	10.700		
Fry (fed)	10.200		
Fingerling	9.700		
Smolt			

Hatchery	MAIN BAY	Species	PINKS
Year	1987	to Year	1988
Green Egg	89.400		
Eyed Egg	80.460		
Fry (emerge)	76.440		
Fry (fed)	---		
Fingerling	---		
Smolt	---		

Hatchery	SIQUSUILAQ	Species	CHUM
Year	1983	to Year	1987
Green Egg	2.000		
Eyed Egg	1.800		
Fry (emerge)	1.710		
Fry (fed)	1.624		
Fingerling	1.624		
Smolt	-----		

Hatchery	MAIN BAY	Species	PINKS
Year	1989	to Year	1989
Green Egg	73.440		
Eyed Egg	67.890		
Fry (emerge)	64.500		
Fry (fed)	----		
Fingerling	----		
Smolt	----		

Hatchery	SIQUSUILAQ	Species	CHUM
Year	1988	to Year	2003
Green Egg	40.000		
Eyed Egg	36.000		
Fry (emerge)	34.200		
Fry (fed)	32.600		
Fingerling	32.600		
Smolt	-----		

Hatchery	MAIN BAY	Species	PINKS
Year	1990	to Year	2003
Green Egg	46.780		
Eyed Egg	42.110		
Fry (emerge)	40.000		
Fry (fed)	----		
Fingerling	----		
Smolt	----		

Hatchery		Species	
Year		to Year	
Green Egg			
Eyed Egg			
Fry (emerge)			
Fry (fed)			
Fingerling			
Smolt			

- Continued -

Continued.

MILLIONS OF FISH

Hatchery TRAIL LAKES	Species SOCKEYE	Hatchery _____	Species _____
Year 1983	to Year 2003	Year _____	to Year _____
Green Egg	31.950	Green Egg	
Eyed Egg	27.160	Eyed Egg	
Fry (emerge)	25.800	Fry (emerge)	
Fry (fed)	24.300	Fry (fed)	
Fingerling	----	Fingerling	
Smolt	----	Smolt	
Hatchery TRAIL LAKES	Species CHINOOK	Hatchery _____	Species _____
Year 1983	to Year 2003	Year _____	to Year _____
Green Egg	3.860	Green Egg	
Eyed Egg	3.470	Eyed Egg	
Fry (emerge)	3.300	Fry (emerge)	
Fry (fed)	3.200	Fry (fed)	
Fingerling	3.100	Fingerling	
Smolt	----	Smolt	
Hatchery TRAIL LAKES	Species COHO	Hatchery _____	Species _____
Year 1983	to Year 2003	Year _____	to Year _____
Green Egg	6.080	Green Egg	
Eyed Egg	5.470	Eyed Egg	
Fry (emerge)	5.200	Fry (emerge)	
Fry (fed)	4.900	Fry (fed)	
Fingerling	4.600	Fingerling	
Smolt	-----	Smolt	
Hatchery TUTKA	Species PINKS	Hatchery _____	Species _____
Year 1983	to Year 2003	Year _____	to Year _____
Green Egg	29.970	Green Egg	
Eyed Egg	25.470	Eyed Egg	
Fry (emerge)	24.200	Fry (emerge)	
Fry (fed)	12.110	Fry (fed)	
Fingerling	10.900	Fingerling	
Smolt	---	Smolt	
Hatchery _____	Species _____	Hatchery _____	Species _____
Year _____	to Year _____	Year _____	to Year _____
Green Egg		Green Egg	
Eyed Egg		Eyed Egg	
Fry (emerge)		Fry (emerge)	
Fry (fed)		Fry (fed)	
Fingerling		Fingerling	
Smolt		Smolt	

APPENDIX C:

Life-Stage Survival Assumptions

Survival Expectations reflect an estimate of the most likely long term survivals for each species or stock of fish at a given facility. There has been a concious effort to make predictions based on a synthesis of past survival data and/or performance of similar species in similar programs. The predicted survival rates also reflect any uncertainties associated with the project which might affect average suvivals over time.

Hatchery Project	Species	Hatchery Survivals from previous life stages					Marine survivals to adult from:			
		EY	EM	FD	FG	SM	EM	FD	FG	SM
1. Beaver Falls	Chum	90%	95	95	95	0	1.0	--	1.5	--
2. Crooked Crk.	Sockeye	90	95	95	95	--	--	1.0	1.0	--
3. Big Lake	Sockeye	85	95	95	--	--	--	1.6	--	--
	Sockeye (Rehab)	85	95	95	--	--	--	1.6	--	--
	Coho	93	95	95	95	--	--	--	1.0	--
	Coho (Rehab)	93	95	95	95	--	--	--	1.0	--
4. Clear Creek	Grayling	90	80	80	--	--	7.5	--	--	--
	Chum	90	95	95	95	--	--	--	2.0	--
	Chinook	90	95	95	95	--	--	--	0.6	--
	Sheefish	90	90	--	--	30	--	--	--	
5. Cannery Crk.	Pinks	94	95	--	--	--	3.0	--	--	--
6. Crystal Lake	Chinook	77	84	90	80	74	--	--	--	3.0
	Steelhead	53	96	98	100	75	--	--	--	3.0
	Chum	88	98	80	--	--	--	1.0	--	--
	Coho	95	99	99	100	97	--	--	--	3.0

EY= Eying FD= Fed Fry
SM= Smolt EM= Emergence
FG= Fingerling

HATCHERY PROJECT	SPECIES	HATCHERY SURVIVALS FROM PREVIOUS LIFE STAGE					MARINE SURVIVAL TO ADULT FROM:			
		EY	EM	FD	FG	SM	EM	FD	FG	SM
7. Deer Mt.	Chinook	90	95	95	95	80	--	--	--	2.4
	Coho	90	95	95	95	80	--	--	1.5	3.0
8. Elmendorf	Chinook	90	95	95	95	95	--	--	--	1.5
	Rainbow	90	98	85	60	98	--	37.5	0	75
	Coho (landlocked)	90	95	95	95	--	---	--	50	--
	Coho (Anad)	90	95	90	100	80	--	0.5	1.0	5.0
9. Ft. Rich	Rainbow	80	85	90	98	98	--	37.5	--	75.0
	Coho	90	95	95	95	80	--	--	1.0	5.0
	Chinook	90	95	95	95	80	--	--	--	1.0
	Steelhead	80	85	90	98	98	--	--	--	1.5
10. Frazer	Sockeye	--	--	--	--	--	--	--	--	--
11. Gulkana	Sockeye	90	93	--	--	--	1.0	--	--	--
12. Karluk	Sockeye	85	30	--	--	--	1.0	--	--	--
	Sockeye (Rehab)	85	30	--	--	--	1.0	--	--	--
13. Kitoi	Chum	90	95	95	95	--	0.7	1.0	2.0	--
	Pink	90	95	95	95	--	1.7	0	3.2	--
14. Klawock	Coho	90	95	95	95	80	--	--	--	4.0
	Steelhead	90	95	90	90	75	--	1.0	--	3.0
	Chum	90	95	95	90	--	--	--	2.0	--
15. Hidden Falls	Chum	90	97	95	95	--	.7	1.5	3.0	--
	Chinook	90	95	95	95	80	--	0.3	0.6	3.0

HATCHERY PROJECT	SPECIES	HATCHERY SURVIVALS FROM PREVIOUS LIFE STAGE					MARINE SURVIVAL TO ADULT FROM:			
		EY	EM	FD	FG	SM	EM	FD	FG	SM
16. Main Bay	Chums	90	95	95	95	--	0.7	1.0	2.0	--
	Pinks	90	95	95	95	--	3.9	--	5.0	--
17. Russell Crk.	Chum	90	95	95	95	--	--	--	2.0	--
18. Sikusuilaq	Chum	90	95	95	--	---	--	1.0	--	--
19. Trail Lake	Sockeye	85	95	95	--	--	--	1.0	--	--
	Chinook	90	95	95	95	--	--	--	0.6	--
	Coho	90	95	95	95	95	--	--	1.0	--
20. Tutka	Pinks	85	95	100	90	--	4.0	--	8.0	--

APPENDIX D:

Net Present Values and Benefit-Cost Ratios of Individual Hatcheries

Hatchery	Inc. Value - Public cost(NPV) (X$1,000,000)	Year of Payback	Final Inc. Value Public Cost Ratio (B/C ratio)
1. BEAVER FALLS	9.85	1989	3.1
2. BIG LAKE	12.14	1982	3.5
3. CANNERY CREEK			
BASE	16.21	1985	2.8
CIP	16.72	1985	2.7
4. CLEAR CREEK	22.62	1982	4.7
5. CROOKED CREEK	5.22	1987	2.1
6. CRYSTAL LAKE			
BASE	8.65	1985	1.9
CIP	7.49	1992	1.7
7. DEER MOUNTAIN			
BASE	0.53	NA	0.8
CIP	0.45	NA	0.9
8. ELMENDORF	34.50	1982	4.8
9. FORT RICHARDSON			
BASE	125.16	1987	13.8
CIP	125.57	1987	14.5
VISITORS	0.04	1995	1.6
10. FRAZER	45.22	1982	80.9
11. GULKANA	4.02	1989	2.4
12. HIDDEN FALLS	33.47	1986	4.0
13. KARLUK	-1.70	NA	.7
14. KITOI	11.03	1984	2.4
15. KLAWOCK			
BASE	3.69	1990	1.4
CIP	11.43	1991	2.2
16. MAIN BAY	36.46	1984	4.6
17. RUSSELL CREEK	-1.60	NA	0.8
18. SIKUSUILAQ	-6.37	NA	0.4
19. TRAIL LAKES	23.15	1991	3.3
20. TUTKA	11.30	1984	2.5
21. SNETTISHAM			
BASE	16.54	1986	2.9
CIP	57.32	1987	5.8

Note: B/C calculations done to the nearest dollar, but reported here in a rounded format. Rounding errors can be expected.

APPENDIX E:

Projections of Annual Operating Costs by Hatchery

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Beaver Falls Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	193.7	29.06	29.06	251.81
	FR: 1984 TO: 2003	249.0	37.35	37.35	323.70
Crooked Creek Hatchery	FR: 1982 TO: 1982	316.9	47.54		411.97
	FR: 1983 TO: 1983	363.62	54.54	54.54	472.7
	FR: 1984 TO: 2003	316.9	47.54	47.54	411.97
Klawock Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	353.2	52.98	52.98	459.16
	FR: 1984 TO: 2003	425.7	63.86	63.86	553.41
Snettisham Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	420.8	63.12	63.12	547.04

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Snettisham Hatchery (Cont'd)	FR: 1984 TO: 2003	516.1	77.42	77.42	670.93
Deer Mountain Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	126.6	18.99	18.99	164.58
	FR: 1984 TO: 2003	249.0	37.35	37.35	323.7
Hidden Falls Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	498.1	74.72	74.72	647.53
	FR: 1984 TO: 2003	580.0	87.0	87.0	754.0
Crystal Lake Hatchery	FR: 1982 TO: 1982				
	FR: 1983 TO: 1983	438.5	65.78	65.78	570.05
	FR: 1984 TO: 2003	464.4	69.66	69.66	603.72

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Big Lake Hatchery	FR: 1982 TO: 1982	127.77	19.17	19.17	166.10
	FR: 1983 TO: 1983	269.4	40.41	40.41	350.22
	FR: 1984 TO: 2003	236.0	35.40	35.40	306.8
Clear Hatchery	FR: 1982 TO: 1982	261.11	39.18	39.18	339.10
	FR: 1983 TO: 1983	293.7	44.06	44.06	381.81
	FR: 1984 TO: 2003	292.1	43.82	43.82	379.73
Elmendorf Hatchery	FR: 1982 TO: 1982	474.1	71.2	71.2	616.2
	FR: 1983 TO: 1983	551.6	82.74	82.74	717.08
	FR: 1984 TO: 2003	429.3	64.4	64.4	558.09
Ft. Richardson Hatchery	FR: 1982 TO: 1982	300.3	45.05	45.05	390.0
	FR: 1983 TO: 1983	281.5	42.23	42.23	365.95

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Ft. Richardson Hatchery (Cont'd)	FR: 1984 TO: 2003	409.7	61.46	61.46	532.61
Frazer Fish Pass	FR: 1982 TO: 1982	30.0*	4.5	*	34.5
	FR: 1983 TO: 1983	30.0*	4.5		34.5
		No additional evaluation costs; all eliminated at Frazer			
	FR: 1984 TO: 2001	30.0*	4.5	*	34.5
Gulkana Incubation	FR: 1982 TO: 1982	160.0	24.0	*	184.0
	FR: 1983 TO: 1983	160.0	24.0	*	184.0
	FR: 1984 TO: 2003	160.0	24.0	*	184.0
Karluk Hatchery	FR: 1982 TO: 1982	159.23	23.89	23.89	207.0
	FR: 1983 TO: 1983	225.1	33.77	*	258.87
	FR: 1984 TO: 2003	363.5	54.53	*	418.03

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Kitoi Hatchery	FR: 1982 TO: 1982	401.54	60.23	60.23	522.0
	FR: 1983 TO: 1983	363.5	54.53	54.53	472.55
	FR: 1984 TO: 2003	489.1	73.37	73.37	635.83
Main Bay Hatchery	FR: 1982 TO: 1982	113.02	16.95	16.95	146.9
	FR: 1983 TO: 1983	285.6	42.84	42.84	371.28
	FR: 1984 TO: 1986	36.61	54.92	54.92	475.93
	FR: 1986 TO: 2003	550.0	82.5	82.5	715.0
Russell Creek Hatchery	FR: 1982 TO: 1982	522.0	78.3	78.3	678.6
	FR: 1983 TO: 1983	462.2	69.33	69.33	600.86
	FR: 1984 TO: 1984	92.6	13.89	13.89	120.38
	FR: 1985 TO: 2003	462.2	69.33	69.33	600.86
	(Assumes hatchery will operate that year)				

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Sikusuilaq Springs Hatchery	FR: 1982 TO: 1982	300.0	45.0	45.0	390.0
	FR: 1983 TO: 1983	270.10	42.52	42.52	351.13
	FR: 1984 TO: 2003	302.1	45.32	45.32	392.73
Trail Lakes Hatchery	FR: 1982 TO: 1982	62.69	9.41	9.41	81.5
	FR: 1983 TO: 1983	410.5	61.58	61.58	533.65
	FR: 1984 TO: 1990	359.0	53.85	53.85	466.70
	FR: 1991 TO: 2003	600.0	90.0	90.0	780.00
Tutka Hatchery	FR: 1982 TO: 1982	337.69	50.66	50.66	439.0
	FR: 1983 TO: 1983	388.4	58.26	58.26	504.92
	FR: 1984 TO: 2003	391.5	58.73	58.73	508.95

*Dollars in thousands

HATCHERY	DATE	ORIGINAL*	ADMINISTRATION*	EVALUATION*	TOTAL*
Cannery Creek	FR: 1982 TO: 1982	374.62			487.0
	FR: 1983 TO: 1983	393.0	58.95	58.95	510.90
	FR: 1984 TO: 2003	430.3	64.55	64.55	559.39

*Dollars in thousands

APPENDIX F:

Table 1. Nominal and Real Wholesale Price of Salmon for All Species in the Past 20 Years.

Table 2. Past and Projected Exvessel and Wholesale Prices for Enhancement Projections by Hatchery.

Table 1. Nominal and real wholesale price of salmon for all species in the past 20 years.

Year	Sockeye		Pink		Chum		Chinook		Meat, Poultry, and Fish, Wholesale Price Index
	Nominal Price	Real Price	Nominal Price	Real Price	Nominal Price	Real Price	Nominal Price	Real Price	
1960									93.1
1961	35.48	39.03	27.96	30.77	25.14	27.66	32.00	35.20	90.9
1962	35.05	37.13	27.38	29.00	24.87	26.35	31.76	33.53	94.4
1963	36.05	40.55	24.04	27.04	20.28	22.81	31.42	35.34	88.9
1964	38.90	44.97	22.03	25.47	19.63	22.69	31.56	36.49	86.5
1965	38.65	40.18	23.40	24.32	19.53	20.30	31.16	32.39	96.2
1966	36.20	34.48	28.33	26.98	24.28	23.12	30.50	29.05	105.0
1967	37.60	37.60	28.92	28.92	25.76	25.76	31.16	31.16	100.0
1968	40.31	39.10	31.99	31.03	28.80	27.93	34.00	32.98	103.1
1969	42.64	37.47	31.28	27.49	27.67	24.31	34.73	30.52	113.8
1970	43.19	37.30	32.65	28.20	28.71	24.79	37.17	32.10	115.8
1971	42.85	36.94	34.86	30.05	30.56	26.34	37.70	32.50	116.0
1972	51.08	39.29	40.01	30.78	34.27	26.36	...	...	130.0
1973	76.74	45.81	54.25	32.39	48.48	28.94	...	...	167.5
1974	109.31	66.86	70.97	43.41	65.45	40.03	...	...	163.5
1975	83.14	43.53	69.65	36.47	59.63	31.22	...	...	191.0
1976	82.78	45.59	68.53	37.74	59.78	32.92	...	...	181.6[2]
1977	88.62	48.69	67.02	36.82	58.99	32.41	...	...	182.0[2]
1978	92.00	43.77	66.00	31.40	57.00	27.12	...	...	210.2[2,3]

Bureau of Commerical Fisheries. Food Fish Situation and Outlook 1960-1970. NMFS. Food Fish Market Review and Outlook. 1971-1978 in Orth 1981.

[1]Standard 48-pound cases, Seattle pricing points.

[2]Preliminary, subject to revision.

[3]Six-month average.

Table 2. Past and projected exvessel and wholesale prices for enhancement projections by hatchery.

TUTKA

Species: Pink	79	80	81	Ave. 82	82	83-2000
Gear Type						
Set Net	.50	.45	.40	.45	.38	.38
Purse Seine	.50	.45	.40	.45	.38	.38
Processing Method						
Canning	1.73	1.96	1.63	1.77	1.53	1.56
Fresh/Frozen	1.18	.85	1.15	1.06	1.10	1.10

CROOKED CREEK

Species: Sockeye	79	80	81	Ave. 82	82	83-2000
Gear Type						
Gillnet	11		1.25	1.13	1.10	1.30
Purse Seine			1.10		.95	1.13
Processing Method						
Canning			2.96	2.55	2.13	2.13
Fresh/Frozen			2.39	2.62	2.40	2.40

CLEAR

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Drift Net				.52		.40
Processing Method						
Fresh/Frozen			1.21			2.00
Species: Chinook	79	80	81	Ave. 82	82	83-2000
Drift Net				1.05		1.20
Proc. Fresh				2.12		2.86

- Continued -

Table 2. Continued.

DEER MOUNTAIN

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	1.60	1.03	1.98	1.54	1.85	2.05
Troll	2.79	2.24	2.51	2.51	2.35	2.59
Processing Method						
Fresh/Frozen	3.99	3.57	3.39	3.65	3.20	3.51

Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	1.03	.65	.89	.86	.80	.92
Troll	2.20	1.34	1.33	1.62	1.20	1.37
Gill Net	.98	.55	.54	.69	.47	.56
Processing Method						
Canning	2.03	2.18	1.97	2.06	1.70	2.04
Fresh/Frozen	3.54	2.80	2.55	2.96	2.44	2.63

BEAVER FALLS

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	1.01	.78	.56	.78	.51	.58
Gill Net	1.17	.85	.71	.91	.65	.73
Processing Method						
Canning	1.84	1.71	1.26	1.60	1.09	1.31
Fresh/Frozen	2.14	1.58	1.14	1.62	.99	1.17

- Continued -

Table 2. Continued.

MAIN BAY

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				.51		.52
Processing Method						
Canning				1.74		1.41
Fresh/Frozen				1.46		1.84
Species: Pink	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				.44	.20	.38
Processing Method						
Canning			1.55			1.27(1984) 1.62(1985) 1.63(1986) 1.44(1987) 1.56(1988-2000)

KITOI

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				.52		.52
Beach Seine				.52		.52
Processing Method						
Canning				1.68		1.41
Fresh/Frozen				1.46		1.84
Species: Pink	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	.47	.48	.46	.47	.24	.44
Beach Seine	.47	.48	.46	.47	.24	.44
Processing Method						
Canning	1.27	1.62	1.63	1.51	1.44	1.56

- Continued -

Table 2. Continued.

CRYSTAL LAKE

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	1.60	1.03	1.95	1.53	1.70	2.02
Troll	2.79	2.24	2.33	2.45	2.20	2.41
Gill Net	1.65	1.19	1.25	1.36	1.15	1.30
Processing Method						
Fresh/Frozen	3.99	3.57	3.39	3.65	3.20	3.51

Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine	1.34	.65	.72	.90	.70	.75
Troll	2.20	1.34	1.43	1.66	1.30	1.48
Gill Net	1.79	1.06	.80	1.22	.80	.83
Processing Method						
Canning	2.03	2.18	2.05	2.09	1.88	2.12
Fresh/Frozen	3.54	2.80	2.65	3.00	2.44	2.74

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				.66		.53
Gill Net				.78		.70
Processing Method						
Canning				2.24		1.59
Fresh/Frozen				1.53		1.49

KARLUK

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				1.05	.90	.90
Set Net				1.07	.90	.90
Processing Method						
Canning				2.45	2.29	2.29
Fresh/Frozen				2.57	2.50	2.50

- Continued -

Table 2. Continued.

SNETTISHAM

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Gill Net		.84	.57	.79	.47	.59
Purse Seine		.78	.52	.71	.45	.54
Processing Method						
Canning		1.71	1.44	2.33	1.09	1.49
Fresh/Frozen		1.58	1.14	1.49	.99	1.17

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Gear Type						
Troll				2.21		2.61
Other				1.18		1.40
Processing Method						
Fresh/Frozen				3.20		4.05

Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
Gill Net			.95	1.12	.87	.98
Troll			1.50	1.44	1.39	1.55
Purse Seine			.70	.79	.63	.72
Processing Method						
Canning			2.05	1.87	1.88	2.12
Fresh/Frozen			2.65	2.46	2.44	2.74

HIDDEN FALLS

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine			.51	.67	.44	.52
Troll			.66	.79	.82	.68
Processing Method						
Canning		1.71	1.26	2.27	1.09	1.31
Fresh/Frozen		1.58	1.14	1.49	.99	1.17

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Troll				2.21		2.61
Fresh/Frozen				3.37		4.05

- Continued -

Table 2. Continued.

FORT RICHARDSON

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Purse Seine				1.05		2.00
Fresh/Frozen				2.66		3.50

ELMENDORF

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Set Net				1.46		1.50
Fresh/Frozen				2.66		3.00

CANNERY CREEK

Species: Pink	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine			.51	.51		.51
Set Net			.46	.46	.44	.44
Processing Method						
Canning			1.57	1.57	1.51	1.50

BIG LAKE

Species: Sockeye	79	80	81	Ave. 82	82	83-2000
Gear Type						
All Gears		1.03	1.10	1.16	1.13	1.13
Processing Method						
Canning		2.53	2.37	2.39	2.00	2.45
Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
All Gears			.94	.87	.90	.90
Processing Method						
Canning			1.88	1.81	1.80	1.80

- Continued -

Table 2. Continued.

TRAIL LAKES

Species: Sockeye	79	80	81	Ave. 82	82	83-2000
Gear Type						
Drift Net				1.11	1.10	1.10
Set Net				1.10		1.10
Processing Method						
Canning				2.51		2.13
Fresh/Frozen				2.59		2.40

Species: Chinook	79	80	81	Ave. 82	82	83-2000
Gear Type						
Drift Net				1.53		1.50
Set Net				1.46		1.50
Processing Method						
Fresh/Frozen				2.65		2.75

Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
Drift Net				.94		.83
Set Net				.84		.83
Processing Method						
Canning				1.84		1.90
Fresh/Frozen				3.09		1.90

FRAZER

GULKANA

- Continued -

Table 2. Continued.

KLAWOCK

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine				.68	.51	.58
Gill Net				.79	.65	.73
Processing Method						
Canning				2.73	1.09	1.31
Fresh/Frozen				1.31	.99	1.17

Species: Coho	79	80	81	Ave. 82	82	83-2000
Gear Type						
Purse Seine			1.27	.84	1.25	1.37
Troll			.85	1.41	.70	.92
Gill Net			.52	.96	.50	.56
Processing Method						
Canning			1.96	1.81	1.88	2.12
Fresh/Frozen			2.54	2.59	2.44	2.74

SIKUSUILAQ

Species: Chum	79	80	81	Ave. 82	82	83-2000
Gear Type						
Drift Net					.51	.51
Processing Method						
Fresh/Frozen			.51			.75

RUSSELL CREEK

Gear Type	
Purse Seine	.52
Set	.54
Processing Method	
Canning	1.60
Fresh/Frozen	1.68

- Continued -

APPENDIX G:
Annual Net Present Value Curve
for all Hatcheries in Base and CIP Cases

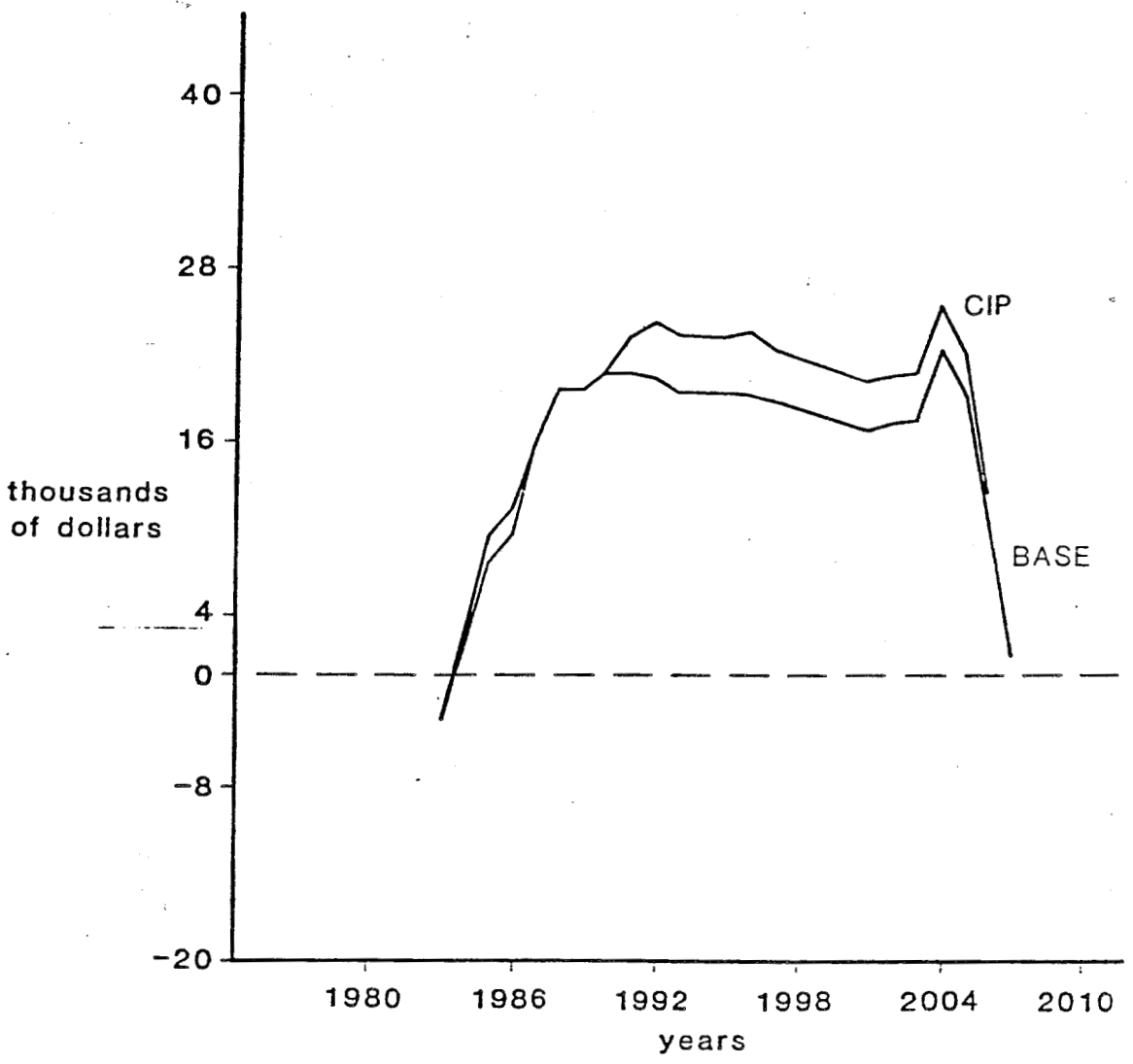

Figure 7. Annual net present value curve for base and CIP cases.

PERSONAL COMMUNICATION

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